

Problem solving: multi-step reasoning in depth: open practice pack

100 untimed questions across 10 authored sections.

Detail	Value
Pack	cognitive-skills-problem-solving
Source	cognitive-skills
Pack version	v1
Worksheet items	100
Authored hints	0
Worked explanations	100

This is untimed educational practice for one cognitive skill. It is not a clinical, diagnostic, employment, or professionally recognized assessment, and it does not produce an IQ score or credential.

The answer key and worked explanations in this file belong only to this public, untimed educational practice source. No active aptitude suite or Novus Reasoning Challenge answer key is ever included in any download.

Learner worksheet

Problem solving is the skill of combining several pieces of information and reaching a practical, well-reasoned answer. Every item is self-contained. All the data you need is in the question. Work through each section at a comfortable pace; the sections build from single careful steps to integrated challenges.

Choose one answer for each item. For a delayed-recall item, read its study text, cover it, and then answer without looking back.

Multi-step foundations

Warm up by combining two or three simple facts into a single answer.

1. problem-solving-s01-q01

Three coworkers restock shared printer paper on different cycles: every 2 days, every 3 days, and every 4 days. All three restocked together today. In how many days will all three restock on the same day again?

- A. 6
- B. 8
- C. 12
- D. 24

Your answer: _____

2. problem-solving-s01-q02

A delivery van can carry either 40 small boxes or 25 large boxes (space scales proportionally by count). It currently carries 16 small boxes. How many large boxes can it still fit?

- A. 9
- B. 12

- C. 15
- D. 18

Your answer: _____

3. problem-solving-s01-q03

A 4-character password uses only the digits 1, 2, 3, and 4, with no digit repeated. How many different passwords are possible?

- A. 4
- B. 12
- C. 24
- D. 64

Your answer: _____

4. problem-solving-s01-q04

Item A sells 8 units per day from a 40-unit stock; Item B sells 5 units per day from a 40-unit stock. Assuming no restocking, which item runs out first, and by how many days sooner?

- A. A, by 2 days
- B. A, by 3 days
- C. B, by 3 days
- D. B, by 5 days

Your answer: _____

5. problem-solving-s01-q05

A task force needs exactly one representative from each of three departments. Sales has 4 possible reps, Engineering has 3, and Support has 2. How many different three-person task forces are possible?

- A. 9
- B. 18
- C. 24
- D. 32

Your answer: _____

6. problem-solving-s01-q06

Four friends (Sam, Priya, Marcus, and Yuki) sit in a row of four seats numbered 1 to 4, left to right. Priya is not at either end. Sam is immediately to the left of Priya. Marcus is in seat 4. Yuki is not in seat 1. Which seat is Yuki in?

- A. Seat 1
- B. Seat 2
- C. Seat 3
- D. Seat 4

Your answer: _____

7. problem-solving-s01-q07

A cinema ticket costs £9 and a snack combo costs £6. Ana buys 2 tickets and 1 combo, paying with £30. How much change does she receive?

- A. £6
- B. £4
- C. £5
- D. £7

Your answer: _____

8. problem-solving-s01-q08

A lift can carry at most 600 kg. Four crates weigh 150 kg, 180 kg, 120 kg, and 200 kg. Which single crate should be left behind so the other three weigh as much as possible without exceeding the limit?

- A. The 150 kg crate
- B. The 180 kg crate
- C. The 200 kg crate
- D. The 120 kg crate

Your answer: _____

9. problem-solving-s01-q09

Tea bags come in boxes of 40. The office uses 25 tea bags per week. How many full weeks will 2 boxes last?

- A. 3
- B. 4
- C. 2
- D. 5

Your answer: _____

10. problem-solving-s01-q10

A bus departs every 15 minutes starting at 09:00. Leo arrives at the stop at 09:50. How long must he wait for the next bus?

- A. 5 minutes
- B. 15 minutes
- C. 25 minutes
- D. 10 minutes

Your answer: _____

Rates, ratios and fair shares

Scale quantities up and down, and split amounts in a stated proportion.

11. problem-solving-s02-q01

Three friends share a £45 restaurant bill in the ratio 2 : 3 : 4. How much does the friend with the middle share pay?

- A. £15
- B. £10
- C. £20
- D. £12

Your answer: _____

12. problem-solving-s02-q02

A printer produces 12 pages per minute. How long will it take to print 300 pages?

- A. 20 minutes
- B. 25 minutes
- C. 30 minutes
- D. 24 minutes

Your answer: _____

13. problem-solving-s02-q03

Orange squash is mixed using 1 part concentrate to 4 parts water. How much concentrate is needed to make 2,000 ml of mixed squash?

- A. 500 ml
- B. 250 ml
- C. 200 ml
- D. 400 ml

Your answer: _____

14. problem-solving-s02-q04

Two decorators working together at the same rate paint a room in 6 hours. How long would one decorator take alone?

- A. 12 hours
- B. 9 hours
- C. 3 hours
- D. 8 hours

Your answer: _____

15. problem-solving-s02-q05

A car uses 6 litres of fuel per 100 km. How much fuel is needed for a 250 km journey?

- A. 12 litres
- B. 15 litres
- C. 18 litres
- D. 14 litres

Your answer: _____

16. problem-solving-s02-q06

Nia earns £14 per hour, and time-and-a-half for overtime. One week she works 35 standard hours and 4 overtime hours. What is her total pay?

- A. £546
- B. £560
- C. £588
- D. £574

Your answer: _____

17. problem-solving-s02-q07

A map is drawn at a scale of 1 : 50,000. Two villages are 6 cm apart on the map. What is the real distance between them?

- A. 3 km
- B. 30 km
- C. 0.3 km
- D. 5 km

Your answer: _____

18. problem-solving-s02-q08

A recipe for 4 people needs 300 g of rice. How much rice is needed for 10 people?

- A. 650 g
- B. 700 g
- C. 750 g
- D. 800 g

Your answer: _____

19. problem-solving-s02-q09

£120 is shared between two grandchildren so that the elder receives twice as much as the younger. How much does the younger receive?

- A. £60
- B. £40
- C. £30
- D. £80

Your answer: _____

20. problem-solving-s02-q10

A tap fills a 90-litre water butt in 45 minutes at a steady rate. After 30 minutes the tap is turned off. How many more litres are needed to fill the butt?

- A. 20 litres
- B. 45 litres
- C. 25 litres
- D. 30 litres

Your answer: _____

Working backwards

Start from the final result and reverse each step to recover the starting value.

21. problem-solving-s03-q01

Mia thinks of a number, doubles it, then adds 7 to get 31. What number did she start with?

- A. 10
- B. 12
- C. 14
- D. 19

Your answer: _____

22. problem-solving-s03-q02

After spending half his money on lunch and then £4 on a coffee, Ben has £6 left. How much did he start with?

- A. £20
- B. £16
- C. £24
- D. £18

Your answer: _____

23. problem-solving-s03-q03

A number is divided by 3, then 5 is subtracted, giving 7. What was the original number?

- A. 26
- B. 21
- C. 30
- D. 36

Your answer: _____

24. problem-solving-s03-q04

A shop reduces a coat by 20% to a sale price of £48. What was the original price?

- A. £57.60
- B. £56
- C. £60
- D. £64

Your answer: _____

25. problem-solving-s03-q05

A patch of mould on a slice of bread doubles in area every day. It covers the whole slice on day 12. On which day did it cover exactly a quarter of the slice?

- A. Day 3
- B. Day 10
- C. Day 9
- D. Day 11

Your answer: _____

26. problem-solving-s03-q06

Three siblings take sweets from a jar in turn. Aisha takes half of the sweets, Ben takes half of what remains, and Cara takes the final 6, leaving the jar empty. How many sweets were in the jar at the start?

- A. 18
- B. 30
- C. 20
- D. 24

Your answer: _____

27. problem-solving-s03-q07

A train arrives at 14:20 after a journey of 2 hours 45 minutes. It departed 10 minutes late. What was its scheduled departure time?

- A. 11:25
- B. 11:35
- C. 11:45
- D. 11:15

Your answer: _____

28. problem-solving-s03-q08

After a 10% pay rise, Omar earns £22,000. What did he earn before the rise?

- A. £19,800
- B. £21,000
- C. £20,000
- D. £19,000

Your answer: _____

29. problem-solving-s03-q09

In a knockout quiz tournament, half the teams are eliminated in each round. After three rounds, 4 teams remain. How many teams started?

- A. 24
- B. 32
- C. 16
- D. 48

Your answer: _____

30. problem-solving-s03-q10

A photocopier's counter reads 5,230 at the end of the day. During the day it printed two jobs of 340 pages each and one job of 195 pages. What did the counter read at the start of the day?

- A. 4,455
- B. 4,365
- C. 4,255
- D. 4,355

Your answer: _____

Constraints and elimination

Use each clue to rule options out until only one possibility survives.

31. problem-solving-s04-q01

Three lockers (numbered 1, 2, and 3) belong to Finn, Grace, and Hana, one each. Grace's locker is number 2 and Hana's is number 3. Which locker is Finn's?

- A. Locker 1
- B. Locker 2
- C. Locker 3
- D. It cannot be determined

Your answer: _____

32. problem-solving-s04-q02

Four runners finish a race. Dev finishes before Eli but after Fatima. Gus finishes last. Who wins the race?

- A. Dev
- B. Eli
- C. Fatima
- D. Gus

Your answer: _____

33. problem-solving-s04-q03

A cafe offers sandwiches on white, brown, or rye bread. Jo will not eat rye, and the cafe has run out of white. Which bread will Jo's sandwich be on?

- A. White
- B. Brown
- C. Rye
- D. Jo cannot order a sandwich

Your answer: _____

34. problem-solving-s04-q04

Kim, Raj, and Sofia each play exactly one instrument: piano, violin, or drums. Raj plays the violin, and Kim does not play the drums. Which instrument does Kim play?

- A. Piano

- B. Violin
- C. Drums
- D. It cannot be determined

Your answer: _____

35. problem-solving-s04-q05

A 3-digit code uses digits from 1 to 9. The first digit is twice the second, the third digit is the sum of the first two, and the second digit is 3. What is the code?

- A. 369
- B. 636
- C. 963
- D. 639

Your answer: _____

36. problem-solving-s04-q06

Five houses are numbered 1 to 5 along a lane. The blue house is at number 5, the green house is at number 1, and the red house is next to the blue house. What number is the red house?

- A. 2
- B. 3
- C. 4
- D. 5

Your answer: _____

37. problem-solving-s04-q07

Tara is older than Uma. Uma is older than Vik. Wren is younger than Vik. Who is the second oldest?

- A. Uma
- B. Vik
- C. Tara
- D. Wren

Your answer: _____

38. problem-solving-s04-q08

A password is one of: 4412, 4421, 2144, or 1442. It starts with 4 and its last digit is odd. Which is it?

- A. 4412
- B. 4421
- C. 2144
- D. 1442

Your answer: _____

39. problem-solving-s04-q09

Four books (an atlas, a biography, a cookbook, and a dictionary) stand in a row of four positions, left to right. The cookbook is at the far right, the atlas is immediately to the left of the dictionary, and the biography is not

in the first position. Which book is first (far left)?

- A. The biography
- B. The dictionary
- C. The cookbook
- D. The atlas

Your answer: _____

40. problem-solving-s04-q10

Four suspects each make one statement. Ana: 'Ben did it.' Ben: 'I did not do it.' Carl: 'I did not do it.' Dee: 'Ana is telling the truth.' Exactly one statement is true, and exactly one person is responsible. Who is responsible?

- A. Ana
- B. Ben
- C. Carl
- D. Dee

Your answer: _____

Finding the rule

Work out the rule that generates each pattern, then apply it.

41. problem-solving-s05-q01

What is the next number in the sequence 2, 5, 11, 23, 47, ...?

- A. 94
- B. 95
- C. 93
- D. 71

Your answer: _____

42. problem-solving-s05-q02

One number breaks the doubling pattern in this list: 3, 6, 12, 24, 45, 96. Which one?

- A. 6
- B. 24
- C. 96
- D. 45

Your answer: _____

43. problem-solving-s05-q03

A sequence alternates between two operations: add 4, then subtract 1. Starting at 5 it runs 5, 9, 8, 12, 11, ... What is the next number?

- A. 15
- B. 10
- C. 14

- D. 16

Your answer: _____

44. problem-solving-s05-q04

In a simple code, APPLE is written as BQQMF. Using the same rule, how would LEMON be written?

- A. MFOPN
- B. KDLNM
- C. MFNPO
- D. MGNQO

Your answer: _____

45. problem-solving-s05-q05

What is the missing number: 1, 4, 9, 16, __, 36?

- A. 24
- B. 25
- C. 20
- D. 30

Your answer: _____

46. problem-solving-s05-q06

In this sequence each term is the sum of the two before it: 4, 7, 11, 18, 29, ... What comes next?

- A. 40
- B. 36
- C. 44
- D. 47

Your answer: _____

47. problem-solving-s05-q07

Shapes repeat in the fixed cycle: star, moon, moon, sun, star, moon, moon, sun, ... What is the 11th shape?

- A. Star
- B. Sun
- C. Moon
- D. It cannot be determined

Your answer: _____

48. problem-solving-s05-q08

A rule maps 6 -> 15, 8 -> 19, and 10 -> 23. Using the same rule, what does 12 map to?

- A. 27
- B. 25
- C. 26
- D. 29

Your answer: _____

49. problem-solving-s05-q09

What is the next term in the sequence 3, 4, 6, 9, 13, 18, ...?

- A. 22
- B. 23
- C. 25
- D. 24

Your answer: _____

50. problem-solving-s05-q10

A sequence follows the rule: double the number, then subtract the digit sum of the result. Starting from 8 it runs $8 \rightarrow (16 - 7) = 9 \rightarrow (18 - 9) = 9 \rightarrow \dots$ What happens to the sequence from this point on?

- A. It grows without limit
- B. It stays at 9 forever
- C. It alternates between 9 and 18
- D. It eventually reaches 0

Your answer: _____

Planning and scheduling

Fit tasks and journeys into time, watching for gaps, breaks, and overlaps.

51. problem-solving-s06-q01

Rosa needs 3 hours to paint a fence. She starts at 15:30 and takes one 20-minute break. At what time will she finish?

- A. 18:50
- B. 18:30
- C. 18:20
- D. 19:00

Your answer: _____

52. problem-solving-s06-q02

A load of laundry takes 50 minutes to wash and 70 minutes to dry, and drying can only start once washing ends. If the load goes in at 10:15, when is it fully dry?

- A. 11:55
- B. 12:05
- C. 12:15
- D. 12:25

Your answer: _____

53. problem-solving-s06-q03

A meal needs three tasks: chop vegetables (10 minutes, hands-on), simmer the sauce (30 minutes, unattended once started), and boil the pasta (12 minutes, can run alongside the simmering sauce). Chopping must finish before the sauce starts. What is the shortest total time until everything is ready?

- A. 52 minutes
- B. 30 minutes
- C. 42 minutes
- D. 40 minutes

Your answer: _____

54. problem-solving-s06-q04

Meetings A and B each last 45 minutes, and B cannot start until 15 minutes after A ends (to allow the room to be reset). A starts at 09:00. What is B's earliest finish time?

- A. 10:45
- B. 10:30
- C. 11:00
- D. 10:15

Your answer: _____

55. problem-solving-s06-q05

A ferry crosses to an island every 40 minutes, with the first crossing at 08:00 and the last at 18:00. How many crossings run in the day?

- A. 15
- B. 16
- C. 17
- D. 14

Your answer: _____

56. problem-solving-s06-q06

An article needs three full-day stages in strict order: drafting (2 days), review (1 day), and publishing (1 day). Reviews are only held on Tuesdays. Drafting starts on a Monday and fills that Monday and Tuesday. What is the earliest day the article can publish?

- A. Thursday of the same week
- B. Tuesday of the following week
- C. Friday of the same week
- D. Wednesday of the following week

Your answer: _____

57. problem-solving-s06-q07

Amir must catch a 17:12 train. The walk to the station takes 25 minutes, and he wants to arrive 10 minutes early. What is the latest time he should leave?

- A. 16:47

- B. 16:42
- C. 16:37
- D. 16:27

Your answer: _____

58. problem-solving-s06-q08

Two machines process orders continuously from 09:00. Machine 1 finishes an order every 8 minutes; Machine 2 finishes one every 12 minutes. At what time do they next finish an order at the same moment?

- A. 09:24
- B. 09:48
- C. 09:20
- D. 09:36

Your answer: _____

59. problem-solving-s06-q09

A project has three tasks: P takes 3 days, Q takes 2 days, and R takes 4 days. Q and R can run at the same time, but both may only start after P finishes. What is the shortest overall project duration?

- A. 9 days
- B. 7 days
- C. 5 days
- D. 6 days

Your answer: _____

60. problem-solving-s06-q10

A clinic runs 20-minute appointments back to back from 09:00, pauses completely from 12:00 to 12:30, and closes at 14:30. Appointments cannot be shortened and cannot overlap the break. How many appointments fit in the day?

- A. 13
- B. 16
- C. 14
- D. 15

Your answer: _____

Trade-offs and best choices

Compare the options fairly. Put them on the same footing before deciding which wins.

61. problem-solving-s07-q01

Shop A sells 6 eggs for £1.50. Shop B sells 10 eggs for £2.30. Which shop is cheaper per egg, and at what price?

- A. Shop A, at 25p per egg
- B. Shop B, at 23p per egg
- C. Shop A, at 23p per egg
- D. They cost the same per egg

Your answer: _____

62. problem-solving-s07-q02

One phone plan costs £12 per month plus £2 per gigabyte of data used. Another costs a flat £20 per month with unlimited data. At what monthly data use do the two plans cost the same?

- A. 2 GB
- B. 3 GB
- C. 4 GB
- D. 5 GB

Your answer: _____

63. problem-solving-s07-q03

A car park charges £2.50 per hour or £9 for a full-day ticket. From how many whole hours of parking does the day ticket become the cheaper option?

- A. 4 hours
- B. 3 hours
- C. 5 hours
- D. 6 hours

Your answer: _____

64. problem-solving-s07-q04

A courier's bike carries at most 16 kg. The parcels available weigh 9 kg, 7 kg, 6 kg, and 4 kg. Which combination carries the most weight without exceeding the limit?

- A. 9 kg + 6 kg
- B. 7 kg + 6 kg + 4 kg
- C. 9 kg + 4 kg
- D. 9 kg + 7 kg

Your answer: _____

65. problem-solving-s07-q05

An online store offers a choice of discounts: 15% off everything, or £10 off orders over £60. Which saves more on a £70 order?

- A. £10 off, saving £10
- B. 15% off, saving £10.50
- C. Both save the same
- D. 15% off, saving £9.50

Your answer: _____

66. problem-solving-s07-q06

A gardener has 24 metres of fencing for a rectangular bed with whole-metre sides. Which dimensions give the largest area?

- A. 8 m x 4 m

- B. 10 m x 2 m
- C. 6 m x 6 m
- D. 7 m x 5 m

Your answer: _____

67. problem-solving-s07-q07

A commuter can drive (35 minutes, £4.20 in fuel), take the bus (50 minutes, £2.60), or cycle (55 minutes, free). Her firm rule is to arrive within 45 minutes; among options that meet the rule she picks the cheapest. Which should she choose?

- A. The bus
- B. Cycling
- C. The bus and cycling tie
- D. Driving

Your answer: _____

68. problem-solving-s07-q08

Printer cartridges are sold singly for £18 (400 pages each) or as a twin pack for £30 (800 pages). How much does the twin pack save per 800 pages compared with buying singles?

- A. £4
- B. £6
- C. £8
- D. £12

Your answer: _____

69. problem-solving-s07-q09

A bake sale prices cupcakes at 80p each, or 3 for £2. What is the cheapest cost of exactly 7 cupcakes?

- A. £4.80
- B. £5.60
- C. £4.66
- D. £5.20

Your answer: _____

70. problem-solving-s07-q10

A 90-minute workshop must fit 4 talks of 20 minutes each, with breaks of at least 5 minutes between consecutive talks. Does the schedule fit?

- A. Yes, with 10 minutes spare
- B. Yes, with exactly no spare time
- C. No: it overruns by 5 minutes
- D. No: it overruns by 15 minutes

Your answer: _____

Multi-stage processes

Follow a quantity through several stages in turn, updating it carefully at each step.

71. problem-solving-s08-q01

A workshop makes items in three stages: cutting (2 minutes per unit), assembly (3 minutes per unit), and packing (1 minute per unit). One worker completes all three stages for each unit before starting the next unit. How long does it take to finish 5 units?

- A. 30 minutes
- B. 25 minutes
- C. 36 minutes
- D. 28 minutes

Your answer: _____

72. problem-solving-s08-q02

Water flows into a 100-litre tank at 8 litres per minute while a leak drains 3 litres per minute. The tank starts empty. How long until it overflows?

- A. 12.5 minutes
- B. 20 minutes
- C. 25 minutes
- D. 33 minutes

Your answer: _____

73. problem-solving-s08-q03

A document passes through three approvers in sequence. Each approver takes 2 working days, and there is a 1-day handover between consecutive approvers. How many working days pass from submission to final approval?

- A. 6
- B. 9
- C. 7
- D. 8

Your answer: _____

74. problem-solving-s08-q04

In a game, each level doubles your coins, but you pay a 10-coin entry fee before each level starts. Starting with 30 coins, how many do you have after two levels?

- A. 60
- B. 80
- C. 100
- D. 50

Your answer: _____

75. problem-solving-s08-q05

A batch of 200 parts goes through two inspections: 10% fail the first check, and of those that pass, 5% fail the second. How many parts pass both checks?

- A. 180
- B. 170
- C. 171
- D. 190

Your answer: _____

76. problem-solving-s08-q06

A savings account pays 5% interest at each year end, and £100 is deposited at the start of each year. Starting from £0, what is the balance at the end of year two?

- A. £210
- B. £215.25
- C. £205
- D. £220.50

Your answer: _____

77. problem-solving-s08-q07

A recycling plant receives 400 kg of mixed waste. 60% of the input is paper, but 25% of that paper is too contaminated to recycle. How much paper is actually recycled?

- A. 240 kg
- B. 100 kg
- C. 60 kg
- D. 180 kg

Your answer: _____

78. problem-solving-s08-q08

A relay team of three swimmers must finish in under 6 minutes in total. The first swims in 1 minute 55 seconds and the second in 2 minutes 5 seconds. What is the slowest the third swimmer can be while keeping the team under 6 minutes?

- A. Just under 2 minutes
- B. Just under 1 minute 50 seconds
- C. Just under 2 minutes 10 seconds
- D. Just under 1 minute 30 seconds

Your answer: _____

79. problem-solving-s08-q09

An email campaign sends 1,000 emails. 40% are opened, 15% of opened emails receive a click, and half of those who click go on to sign up. How many people sign up?

- A. 60
- B. 30

- C. 45
- D. 20

Your answer: _____

80. problem-solving-s08-q10

Machine X makes 30 widgets per hour but needs a 15-minute clean after every 2 hours of running. It starts at 08:00. How many complete widgets are made by 12:00?

- A. 120
- B. 110
- C. 112
- D. 115

Your answer: _____

Arrangements, counting and chance

Count possibilities systematically, and reason about likelihood from equally likely outcomes.

81. problem-solving-s09-q01

A cafe offers 3 soups and 4 sandwiches. How many different soup-and-sandwich lunches are possible?

- A. 7
- B. 12
- C. 9
- D. 16

Your answer: _____

82. problem-solving-s09-q02

How many different ways can the three letters of the word TAP be arranged?

- A. 3
- B. 9
- C. 6
- D. 12

Your answer: _____

83. problem-solving-s09-q03

A drawer holds 6 black socks and 4 white socks. Picking in complete darkness, how many socks must you take to be certain of having a matching pair?

- A. 3
- B. 2
- C. 5
- D. 7

Your answer: _____

84. problem-solving-s09-q04

A spinner has 8 equal sectors numbered 1 to 8. What is the probability of spinning an even number greater than 3?

- A. $\frac{1}{2}$
- B. $\frac{1}{4}$
- C. $\frac{5}{8}$
- D. $\frac{3}{8}$

Your answer: _____

85. problem-solving-s09-q05

Four people each shake hands with every other person exactly once. How many handshakes happen?

- A. 12
- B. 4
- C. 6
- D. 8

Your answer: _____

86. problem-solving-s09-q06

A committee of 2 people is chosen from 5 volunteers. How many different committees are possible?

- A. 20
- B. 10
- C. 25
- D. 15

Your answer: _____

87. problem-solving-s09-q07

A bag holds 5 red, 3 green, and 2 yellow marbles. One marble is drawn at random. What is the probability it is NOT green?

- A. $\frac{3}{10}$
- B. $\frac{1}{2}$
- C. $\frac{3}{7}$
- D. $\frac{7}{10}$

Your answer: _____

88. problem-solving-s09-q08

How many 3-digit numbers can be formed from the digits 2, 5, 7, and 8 if no digit may repeat?

- A. 24
- B. 12
- C. 64
- D. 36

Your answer: _____

89. problem-solving-s09-q09

Two fair six-sided dice are rolled. What is the probability that the total is exactly 4?

- A. $\frac{1}{9}$
- B. $\frac{1}{12}$
- C. $\frac{1}{6}$
- D. $\frac{1}{18}$

Your answer: _____

90. problem-solving-s09-q10

A lift starts empty and stops at 4 floors. At each floor exactly one of the two people waiting there gets in. How many different groups of passengers could be in the lift at the end?

- A. 8
- B. 12
- C. 16
- D. 24

Your answer: _____

Integrated challenge problems

The hardest set: each item combines several techniques from earlier sections.

91. problem-solving-s10-q01

A bookshop deal gives a sixth paperback free with every five bought. Paperbacks cost £8 each. Leah wants to leave with 20 paperbacks. How much does she pay?

- A. £160
- B. £128
- C. £144
- D. £136

Your answer: _____

92. problem-solving-s10-q02

Two cyclists start 60 km apart and ride directly towards each other, one at 14 km/h and the other at 16 km/h. How long until they meet?

- A. 2 hours
- B. 1 hour 45 minutes
- C. 2 hours 15 minutes
- D. 1 hour 30 minutes

Your answer: _____

93. problem-solving-s10-q03

A tank contains 240 litres. Pump P drains it at 4 litres per minute. After 20 minutes, pump Q joins in, draining a further 6 litres per minute. How long does emptying the tank take in total?

- A. 40 minutes

- B. 32 minutes
- C. 36 minutes
- D. 24 minutes

Your answer: _____

94. problem-solving-s10-q04

In an office of 40 people, 22 drink coffee, 17 drink tea, and 9 drink both. How many drink neither?

- A. 8
- B. 10
- C. 12
- D. 6

Your answer: _____

95. problem-solving-s10-q05

A train leaves a station at 10:00 travelling at 90 km/h. A second train leaves the same station on the same route at 10:30, travelling at 120 km/h. At what time does the second train catch the first?

- A. 11:30
- B. 12:30
- C. 11:45
- D. 12:00

Your answer: _____

96. problem-solving-s10-q06

Anya is now three times as old as her son. In 12 years she will be exactly twice as old as him. How old is her son now?

- A. 12
- B. 10
- C. 8
- D. 15

Your answer: _____

97. problem-solving-s10-q07

A two-digit number has digits that sum to 9. Reversing its digits produces a number 27 larger. What is the original number?

- A. 63
- B. 45
- C. 36
- D. 27

Your answer: _____

98. problem-solving-s10-q08

Three flatmates split rent of £900 so that Jo pays £60 more than Kai, and Kai pays twice as much as Lee. How much does Kai pay?

- A. £300
- B. £336
- C. £360
- D. £276

Your answer: _____

99. problem-solving-s10-q09

A ferry can carry at most 8 tonnes per crossing. Waiting to cross: a lorry (5 tonnes), a van (2.5 tonnes), and three cars (1.5 tonnes each). The lorry must travel on the first crossing. What is the minimum number of crossings needed to move all the vehicles?

- A. 4
- B. 3
- C. It cannot be done
- D. 2

Your answer: _____

100. problem-solving-s10-q10

In a quiz, a correct answer scores 4 points and a wrong answer loses 1 point; there are no skips. Zara answered all 20 questions and scored 55. How many did she answer correctly?

- A. 15
- B. 14
- C. 16
- D. 13

Your answer: _____

Authored hints

This cognitive practice source does not publish authored hints. Every item is listed as missing a hint, and no hint text is generated or inferred.

100 worksheet items do not have an authored hint. No hint text was generated for them.

Answer key

The answer key and worked explanations in this file belong only to this public, untimed educational practice source. No active aptitude suite or Novus Reasoning Challenge answer key is ever included in any download.

Problem solving: multi-step reasoning in depth: open practice pack answer key

Item	Choice	Answer
problem-solving-s01-q01	C	12
problem-solving-s01-q02	C	15

problem-solving-s01-q03	C	24
problem-solving-s01-q04	B	A, by 3 days
problem-solving-s01-q05	C	24
problem-solving-s01-q06	C	Seat 3
problem-solving-s01-q07	A	£6
problem-solving-s01-q08	D	The 120 kg crate
problem-solving-s01-q09	A	3
problem-solving-s01-q10	D	10 minutes
problem-solving-s02-q01	A	£15
problem-solving-s02-q02	B	25 minutes
problem-solving-s02-q03	D	400 ml
problem-solving-s02-q04	A	12 hours
problem-solving-s02-q05	B	15 litres
problem-solving-s02-q06	D	£574
problem-solving-s02-q07	A	3 km
problem-solving-s02-q08	C	750 g
problem-solving-s02-q09	B	£40
problem-solving-s02-q10	D	30 litres
problem-solving-s03-q01	B	12
problem-solving-s03-q02	A	£20
problem-solving-s03-q03	D	36
problem-solving-s03-q04	C	£60
problem-solving-s03-q05	B	Day 10
problem-solving-s03-q06	D	24
problem-solving-s03-q07	A	11:25
problem-solving-s03-q08	C	£20,000
problem-solving-s03-q09	B	32
problem-solving-s03-q10	D	4,355
problem-solving-s04-q01	A	Locker 1
problem-solving-s04-q02	C	Fatima
problem-solving-s04-q03	B	Brown
problem-solving-s04-q04	A	Piano
problem-solving-s04-q05	D	639
problem-solving-s04-q06	C	4
problem-solving-s04-q07	A	Uma
problem-solving-s04-q08	B	4421
problem-solving-s04-q09	D	The atlas
problem-solving-s04-q10	C	Carl
problem-solving-s05-q01	B	95
problem-solving-s05-q02	D	45

problem-solving-s05-q03	A	15
problem-solving-s05-q04	C	MFNPO
problem-solving-s05-q05	B	25
problem-solving-s05-q06	D	47
problem-solving-s05-q07	C	Moon
problem-solving-s05-q08	A	27
problem-solving-s05-q09	D	24
problem-solving-s05-q10	B	It stays at 9 forever
problem-solving-s06-q01	A	18:50
problem-solving-s06-q02	C	12:15
problem-solving-s06-q03	D	40 minutes
problem-solving-s06-q04	A	10:45
problem-solving-s06-q05	B	16
problem-solving-s06-q06	D	Wednesday of the following week
problem-solving-s06-q07	C	16:37
problem-solving-s06-q08	A	09:24
problem-solving-s06-q09	B	7 days
problem-solving-s06-q10	D	15
problem-solving-s07-q01	B	Shop B, at 23p per egg
problem-solving-s07-q02	C	4 GB
problem-solving-s07-q03	A	4 hours
problem-solving-s07-q04	D	9 kg + 7 kg
problem-solving-s07-q05	B	15% off, saving £10.50
problem-solving-s07-q06	C	6 m x 6 m
problem-solving-s07-q07	D	Driving
problem-solving-s07-q08	B	£6
problem-solving-s07-q09	A	£4.80
problem-solving-s07-q10	C	No: it overruns by 5 minutes
problem-solving-s08-q01	A	30 minutes
problem-solving-s08-q02	B	20 minutes
problem-solving-s08-q03	D	8
problem-solving-s08-q04	A	60
problem-solving-s08-q05	C	171
problem-solving-s08-q06	B	£215.25
problem-solving-s08-q07	D	180 kg
problem-solving-s08-q08	A	Just under 2 minutes
problem-solving-s08-q09	B	30
problem-solving-s08-q10	C	112
problem-solving-s09-q01	B	12
problem-solving-s09-q02	C	6

problem-solving-s09-q03	A	3
problem-solving-s09-q04	D	3/8
problem-solving-s09-q05	C	6
problem-solving-s09-q06	B	10
problem-solving-s09-q07	D	7/10
problem-solving-s09-q08	A	24
problem-solving-s09-q09	B	1/12
problem-solving-s09-q10	C	16
problem-solving-s10-q01	D	£136
problem-solving-s10-q02	A	2 hours
problem-solving-s10-q03	C	36 minutes
problem-solving-s10-q04	B	10
problem-solving-s10-q05	D	12:00
problem-solving-s10-q06	A	12
problem-solving-s10-q07	C	36
problem-solving-s10-q08	B	£336
problem-solving-s10-q09	D	2
problem-solving-s10-q10	A	15

Worked explanations

problem-solving-s01-q01: The next joint restock day is the least common multiple of 2, 3, and 4, which is 12.

problem-solving-s01-q02: 16 of 40 small boxes uses 40% of the space, leaving 60% free: 60% of 25 large boxes = 15.

problem-solving-s01-q03: With 4 distinct digits and no repeats, this is $4! = 24$ arrangements.

problem-solving-s01-q04: Item A lasts $40 \div 8 = 5$ days; Item B lasts $40 \div 5 = 8$ days. A runs out 3 days sooner.

problem-solving-s01-q05: Multiply the independent choices: $4 \times 3 \times 2 = 24$.

problem-solving-s01-q06: Priya must be in seat 2 or 3. If Priya were in seat 3, Sam would be in seat 2, forcing Yuki into seat 1, which is excluded. So Priya is in seat 2, Sam in seat 1, Marcus in seat 4, and Yuki in seat 3.

problem-solving-s01-q07: Work out the total first: $2 \times £9 + £6 = £24$. Then subtract from the payment: $£30 - £24 = £6$.

problem-solving-s01-q08: All four crates total 650 kg: 50 kg over the limit. Removing the lightest crate that clears the excess (120 kg) leaves 530 kg, the heaviest legal load.

problem-solving-s01-q09: Two boxes hold 80 tea bags, and $80 \div 25 = 3.2$, so only 3 complete weeks are covered before the supply runs short.

problem-solving-s01-q10: List the departures: 09:00, 09:15, 09:30, 09:45, 10:00. Arriving at 09:50, the next bus is at 10:00. A 10-minute wait.

problem-solving-s02-q01: The ratio has $2 + 3 + 4 = 9$ parts, so one part is $£45 \div 9 = £5$. The middle share is 3 parts: £15.

problem-solving-s02-q02: Divide the total by the rate: $300 \div 12 = 25$ minutes.

problem-solving-s02-q03: The mix has $1 + 4 = 5$ equal parts, so each part is $2,000 \div 5 = 400$ ml, and concentrate is exactly one part.

problem-solving-s02-q04: Halving the workforce doubles the time when rates are equal: $6 \times 2 = 12$ hours.

problem-solving-s02-q05: 250 km is 2.5 blocks of 100 km, so fuel scales the same way: $6 \times 2.5 = 15$ litres.

problem-solving-s02-q06: Standard pay is $35 \times £14 = £490$. The overtime rate is £21 per hour, adding $4 \times £21 = £84$, for £574 in total.

problem-solving-s02-q07: $6 \text{ cm} \times 50,000 = 300,000 \text{ cm}$. Converting units step by step: $300,000 \text{ cm} = 3,000 \text{ m} = 3 \text{ km}$.

problem-solving-s02-q08: Find the per-person amount first: $300 \div 4 = 75 \text{ g}$. Then scale up: $75 \times 10 = 750 \text{ g}$.

problem-solving-s02-q09: A 2 : 1 split makes 3 equal parts of £40 each; the younger grandchild gets one part.

problem-solving-s02-q10: The rate is $90 \div 45 = 2$ litres per minute, so 30 minutes delivers 60 litres, leaving $90 - 60 = 30$ litres to go.

problem-solving-s03-q01: Reverse the steps in reverse order: subtract 7 ($31 - 7 = 24$), then halve ($24 \div 2 = 12$).

problem-solving-s03-q02: Undo the last step first: before the coffee he had $£6 + £4 = £10$, which was half his money, so he started with £20.

problem-solving-s03-q03: Reverse each operation: add 5 back ($7 + 5 = 12$), then multiply by 3 ($12 \times 3 = 36$).

problem-solving-s03-q04: The sale price is 80% of the original, so divide rather than add: $£48 \div 0.8 = £60$. Adding 20% of £48 back is the classic trap. Percentages of different bases are not interchangeable.

problem-solving-s03-q05: Work backwards by halving: half covered on day 11, a quarter covered on day 10.

problem-solving-s03-q06: Cara's 6 sweets were what remained after two halvings, i.e. a quarter of the jar, so the jar held $6 \times 4 = 24$.

problem-solving-s03-q07: Subtract the journey from the arrival: $14:20 - 2:45 = 11:35$ actual departure. It left 10 minutes late, so the schedule said 11:25.

problem-solving-s03-q08: The new salary is 110% of the old one, so divide: $£22,000 \div 1.1 = £20,000$. Subtracting 10% of the new figure gives the wrong base.

problem-solving-s03-q09: Double once per round going backwards: $4 \rightarrow 8 \rightarrow 16 \rightarrow 32$ teams at the start.

problem-solving-s03-q10: Total pages printed = $340 + 340 + 195 = 875$. Undo the day's printing: $5,230 - 875 = 4,355$.

problem-solving-s04-q01: With lockers 2 and 3 assigned, elimination leaves only locker 1 for Finn.

problem-solving-s04-q02: Chain the clues into one order: Fatima before Dev before Eli, with Gus last, so the full order is Fatima, Dev, Eli, Gus.

problem-solving-s04-q03: One constraint removes rye and another removes white, leaving brown as the only workable option.

problem-solving-s04-q04: The violin is taken by Raj and the drums are ruled out for Kim, so the piano is the only instrument left for her.

problem-solving-s04-q05: Apply the clues in order: the second digit is 3, so the first is 6, and the third is $6 + 3 = 9$, giving 639.

problem-solving-s04-q06: Number 5 is at the end of the lane, so its only neighbour is number 4. The red house must be there.

problem-solving-s04-q07: Linking the comparisons gives one chain: Tara, Uma, Vik, Wren from oldest to youngest. Uma sits second.

problem-solving-s04-q08: Starting with 4 eliminates 2144 and 1442; needing an odd final digit then eliminates 4412, leaving 4421.

problem-solving-s04-q09: With the cookbook fixed in position 4, the atlas–dictionary pair fits at positions 1–2 or 2–3. The second option forces the biography into position 1, which is forbidden, so the atlas is first.

problem-solving-s04-q10: Test each possibility against the 'exactly one true statement' condition. Only if Carl is responsible is a single statement true (Ben's denial); every other candidate makes two or more statements true.

problem-solving-s05-q01: Each term is double the previous term plus 1, so the next is $47 \times 2 + 1 = 95$.

problem-solving-s05-q02: Doubling 24 should give 48, not 45, and doubling 48 would correctly give 96, confirming 45 is the misfit.

problem-solving-s05-q03: Track whose turn it is: the last step was a subtraction, so the next is an addition, $11 + 4 = 15$.

problem-solving-s05-q04: Each letter shifts forward by one place in the alphabet, so L, E, M, O, N become M, F, N, P, O.

problem-solving-s05-q05: These are the square numbers $1^2, 2^2, 3^2, \dots$, the missing term is $5^2 = 25$.

problem-solving-s05-q06: Apply the stated rule to the last two terms: $18 + 29 = 47$.

problem-solving-s05-q07: The cycle has length 4, and $11 = 4 \times 2 + 3$, so the 11th shape matches the 3rd in the cycle: moon.

problem-solving-s05-q08: Each output is double the input plus 3 (check: $2 \times 6 + 3 = 15$), so 12 maps to $2 \times 12 + 3 = 27$.

problem-solving-s05-q09: The gaps grow by one each time: +1, +2, +3, +4, +5. The next gap is +6, giving $18 + 6 = 24$.

problem-solving-s05-q10: Applying the rule to 9 gives $18 - (1 + 8) = 9$ again, so 9 is a fixed point. Once reached, the sequence never changes.

problem-solving-s06-q01: Add the work and the break together: 3 hours 20 minutes after 15:30 is 18:50.

problem-solving-s06-q02: The stages are strictly sequential: $50 + 70 = 120$ minutes, and two hours after 10:15 is 12:15.

problem-solving-s06-q03: Chop for 10 minutes, then start the 30-minute simmer and boil the pasta during it. Only the chopping and simmering lie on the critical path: $10 + 30 = 40$ minutes.

problem-solving-s06-q04: A ends at 09:45; adding the 15-minute changeover lets B start at 10:00 and finish 45 minutes later, at 10:45.

problem-solving-s06-q05: From 08:00 to 18:00 is 600 minutes, which holds $600 \div 40 = 15$ gaps between crossings, but counting both endpoints gives $15 + 1 = 16$ crossings.

problem-solving-s06-q06: Drafting occupies this week's Tuesday, so the earliest available review slot is the following Tuesday, and publishing takes the day after, Wednesday of the following week.

problem-solving-s06-q07: Combine the walk and the margin: 35 minutes before 17:12 is 16:37.

problem-solving-s06-q08: They coincide at the least common multiple of 8 and 12 minutes, which is 24, so at 09:24.

problem-solving-s06-q09: After P's 3 days, Q and R run in parallel, so only the longer of the two matters: $3 + \max(2, 4) = 7$ days.

problem-solving-s06-q10: The morning block (09:00–12:00) is 180 minutes, fitting 9 appointments; the afternoon block (12:30–14:30) is 120 minutes, fitting 6, a total of 15.

problem-solving-s07-q01: Convert both to a unit price: $\pounds 1.50 \div 6 = 25\text{p}$ per egg against $\pounds 2.30 \div 10 = 23\text{p}$ per egg. Shop B wins.

problem-solving-s07-q02: Set the costs equal: £12 + £2 per GB matches £20 when the data charge is £8, i.e. at 4 GB.

problem-solving-s07-q03: Hourly parking costs £7.50 for 3 hours but £10 for 4 hours, so from 4 hours onward the £9 day ticket is cheaper.

problem-solving-s07-q04: Check each total against the limit: $9 + 7 = 16$ kg uses the capacity exactly, while $7 + 6 + 4 = 17$ kg is over and the rest carry less.

problem-solving-s07-q05: Work out each saving on the actual order value: 15% of £70 is £10.50, which beats the flat £10.

problem-solving-s07-q06: All the options use the same perimeter, so compare areas: the closer the sides are to equal, the larger the area, and $6 \times 6 = 36$ m² beats 35, 32, and 20.

problem-solving-s07-q07: Apply the hard constraint before comparing costs: only driving arrives within 45 minutes, so cost never comes into play.

problem-solving-s07-q08: Match the quantities first: 800 pages needs two singles at £36, so the £30 twin pack saves £6.

problem-solving-s07-q09: Use the deal as many times as possible: two 3-for-£2 bundles cover 6 cupcakes for £4, plus one single at 80p makes £4.80.

problem-solving-s07-q10: Count the gaps as well as the talks: $4 \times 20 = 80$ minutes of talks plus $3 \times 5 = 15$ minutes of breaks totals 95 minutes, 5 more than the slot allows.

problem-solving-s08-q01: Each unit takes $2 + 3 + 1 = 6$ minutes from start to finish, so 5 units take $5 \times 6 = 30$ minutes.

problem-solving-s08-q02: Work with the net rate: $8 - 3 = 5$ litres per minute, so $100 \div 5 = 20$ minutes.

problem-solving-s08-q03: Three approvals take $3 \times 2 = 6$ days, and there are only 2 handovers between 3 approvers, adding 2 more days: 8 in total.

problem-solving-s08-q04: Apply fee then doubling, twice: $(30 - 10) \times 2 = 40$, then $(40 - 10) \times 2 = 60$. The order of operations within each level matters.

problem-solving-s08-q05: Take the percentages of the surviving quantity each time: 200 → 180 after the first check, then 5% of 180 (9 parts) fail, leaving 171.

problem-solving-s08-q06: Year one: $£100 \times 1.05 = £105$. Year two starts with $£105 + £100 = £205$, which grows to $£205 \times 1.05 = £215.25$: interest compounds on the running balance, not just the deposits.

problem-solving-s08-q07: Chain the percentages: 60% of 400 kg is 240 kg of paper, and 75% of that survives contamination checks, $0.75 \times 240 = 180$ kg.

problem-solving-s08-q08: The first two legs total exactly 4 minutes ($1:55 + 2:05$), leaving anything under 2 minutes for the final leg.

problem-solving-s08-q09: Follow the funnel stage by stage: 1,000 → 400 opens → 60 clicks → 30 sign-ups. Each percentage applies to the previous stage's result, not the original total.

problem-solving-s08-q10: Running 08:00–10:00 gives 60 widgets, then cleaning lasts until 10:15. From 10:15 to 12:00 is 105 minutes at 2 minutes per widget, 52 complete widgets, for 112 in total.

problem-solving-s09-q01: Independent choices multiply rather than add: $3 \times 4 = 12$ different lunches.

problem-solving-s09-q02: Three positions filled by three distinct letters gives $3 \times 2 \times 1 = 6$ arrangements.

problem-solving-s09-q03: Plan for the worst case: the first two socks could be one of each colour, but a third sock must match one of them. There are only two colours.

problem-solving-s09-q04: List the outcomes that satisfy both conditions: 4, 6, and 8: three of the eight equally likely sectors, so $\frac{3}{8}$.

problem-solving-s09-q05: Each of the 4 people shakes 3 hands, but that counts every handshake twice: 4×3

$$\div 2 = 6.$$

problem-solving-s09-q06: There are $5 \times 4 = 20$ ordered picks, but a committee ignores order, so halve it: 10 distinct pairs.

problem-solving-s09-q07: Use the complement: the chance of green is $3/10$, so the chance of not-green is $1 - 3/10 = 7/10$.

problem-solving-s09-q08: Fill the positions one at a time: 4 choices, then 3, then 2, giving $4 \times 3 \times 2 = 24$ numbers.

problem-solving-s09-q09: Count ordered outcomes over the 36 possible rolls: 1+3, 2+2, and 3+1 give a total of 4, so the probability is $3/36 = 1/12$.

problem-solving-s09-q10: Each floor contributes an independent two-way choice, so the possibilities multiply: $2 \times 2 \times 2 \times 2 = 16$ distinct groups.

problem-solving-s10-q01: Group the books in sixes: three groups cover 18 books while paying for only 15, and the last 2 books are paid in full, 17 paid $\times$ £8 = £136.

problem-solving-s10-q02: When two movers approach each other their speeds add: the gap closes at 30 km/h, so 60 km takes 2 hours.

problem-solving-s10-q03: Split the job into phases: the first 20 minutes drain 80 litres, leaving 160; the combined rate of 10 litres per minute then takes 16 more minutes, for 36 in total.

problem-solving-s10-q04: Avoid double-counting the overlap: coffee or tea drinkers number $22 + 17 - 9 = 30$, so $40 - 30 = 10$ drink neither.

problem-solving-s10-q05: By 10:30 the first train is 45 km ahead. The second closes that gap at $120 - 90 = 30$ km/h, taking 1.5 hours, so it catches up at 12:00.

problem-solving-s10-q06: Let the son's age be s , so Anya is $3s$. In 12 years: $3s + 12 = 2(s + 12)$, which solves to $s = 12$.

problem-solving-s10-q07: Reversing changes the value by 9 times the digit difference, so the digits differ by $27 \div 9 = 3$. Together with a digit sum of 9, the digits are 3 and 6, and the reversal must grow, so the number is 36.

problem-solving-s10-q08: Express everyone in terms of Lee's share x : Kai pays $2x$ and Jo pays $2x + 60$, so $5x + 60 = 900$ gives $x = £168$, and Kai pays $2 \times £168 = £336$.

problem-solving-s10-q09: Pack to the limit: the lorry plus two cars is exactly $5 + 1.5 + 1.5 = 8$ tonnes for crossing one, leaving the van and the last car (4 tonnes) for crossing two.

problem-solving-s10-q10: With r correct answers there are $20 - r$ wrong ones, so $4r - (20 - r) = 55$. That simplifies to $5r = 75$, giving $r = 15$.

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