Mathematics Mastery

Guidance and Mark Scheme

Year 7
Spring Assessment

This is a **formative, diagnostic test** designed to identify the concepts and techniques students have grasped and the areas where they may need more practice.
It examines the last 4 weeks of the Autumn term and the first 7 weeks of the Spring curriculum as well as cumulative material from Y7, 8 and earlier in Y9. It can be sat any time from week 8.

	Examined content										Assessment period			
Week	A8	A9	A10	A11	S1	S2	S3	S4	S5	S7	S8	S9	S10	S11
	Y9U4		Y9U5		Y9U6	Y9U7		Y9U8		Y9U9	Y9U10		Y9U11	
	Solving linear simultaneous equation algebraically		Solving linear simultaneous equations graphically		Angle review	Constructions, congruence and loci		Pythagoras' Theorem		Ratio Review	Similarity and enlargement		Trigonometry	

There are two parts to the test:

Section A: Multiple choice

The first part of this test should be completed online on **Smartgrade** where it will be marked automatically and you will be able to compare the data from your school across the entire partnership of Maths Mastery schools. However, it can be completed on paper if you prefer. We recommend around 40 minutes for this section but you may choose to let your students take longer for them to show you what they know.

Section B: Open response

This section should be completed on a paper copy of the test. We recommend around 30 minutes for this section, but you may choose to let your students take longer for them to show you what they know. We recommend **assessing for mastery** using the guidance contained in this document. This means using this mark scheme to identify areas of strength and weakness to inform your teaching and to feed back to the students.

As this test is formative we strongly encourage you not to give students marks but to use the test as a tool to diagnose their individual strengths and weaknesses, to inform your teaching and to provide high-impact feedback to your students.

Mathematics Mastery

Section A: Multiple choice

1. Work out $376 + 453$

A.	7129	Student did not regroup the answer to $7 + 5$
B.	829	
C.	729	Student recognises that the answer to $7 + 5$ needs regrouping but has not added it on to the hundreds
D.	739	Student has regrouped $7 + 5$ but added the extra 10 tens onto the tens and then also added on to the hundreds.

2. Write the following numbers in order of size starting with the smallest: $-2, 3, -4, -1$

A.	$-4, -2, -1, 3$	
B.	$3, -1, -2, -4$	Ordered correctly but starting with the largest
C.	$-4,3, -2, -1$	Ordered according to absolute value, from largest to smallest
D.	$-1, -2,3, -4$	Ordered according to absolute value

3. Which of these numbers is the largest?

A.	3.08	Student has ignored the zero
B.	3.73	
C.	3.7152	Student thinks that a longer decimal means the number is larger
D.	3.59	Student thinks the final digit indicates size

4. Which of the following is a square number?

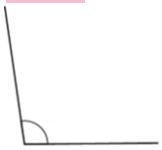
A.	-4	Thinks a square can be negative (maybe because a square root can be negative
B.	2	Thinks $1 \times 1 = 2$
C.	9	
D.	50	May associate factors/multiples of square numbers with squares (100/25)

5. Work out 0.402×10

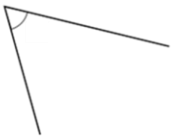
A.	0.0402	Divided by 10
B.	0.4020	'Added' a 0 on the end (a strategy often used to multiply integers by powers of 10, e.g. to determine that $32 \times 10 = 320$)
C.	4.02	
D.	4.2	Digit 4 is in the correct position but the 0 place holder has been ignored

6. Which of these angles is **obtuse**?

A.



B.



C.



D.



7. Simplify $4x + 2y - 3x + y$

A.	$7x + 3y$	Grouped terms without taking account of direction of coefficient (-3), Reinforce the 'sign' in front of the coefficient stays with it
B.	$4xy$	Collected the coefficients and the variables together
C.	$1 + 3y^2$	Thinks that the operation applies to the variable also and thinks $y+y=y^2$
D.	$x + 3y$	

8. Which of the following is a factor of 45?

A.	15	
B.	0	Student things zero can be a factor (does not understand you cannot divide by zero)
C.	4.5	Student does not know that factors must be integers
D.	90	Student has confused factor with multiple.

9. Expand $4(2x - 3)$

A.	$8x - 12$	
B.	$42x - 3$	Written exactly the same but without brackets. Revisit expanding brackets; use arrays to develop understanding
C.	$8x - 3$	Multiplied by first term but not second. Ask student to check answer and revisit expanding using arrays if necessary
D.	$42x - 43$	Distributed 4 across both terms but did not multiply. Remind student that when no symbol is used in algebra the terms are multiplied

10. Work out $-3 - -1$

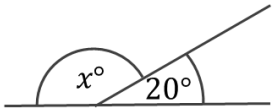
A. -4 — Student has calculated $-3 - 1$ or $-(3 + 1)$.

B. -2

C. 4 — Student has calculated $-3 - 1 = -4$ but because the answer is a negative may think that two negatives make a positive).

D. 2 — Student has calculated $3 - 1$. May have turned -3 into 3 because two negatives make a positive.

11. Work out the value of x



A. $340°$ — $360 - 20 = 340$. Angle sum remembered incorrectly as $360°$

B. $200°$ — $180 + 20 = 200$

C. $70°$ — $90 - 20 = 780$. Angle sum remembered incorrectly as 90^0

D. $160°$

12. Which of these numbers is a multiple of both 4 **and** 6?

A. 2 — Student has worked out a common factor. Check student's understanding of factors/multiples

B. 16 — Student has worked out a multiple of 4 but not 6. Cannot relate common factors of a number or does not understand that one number can be a multiple of many numbers.

C. 18 — Multiple of 6 but not 4. Cannot relate common factors of a number or does not understand that one number can be a multiple of many numbers.

D. 24

13. Work out the value of $8 - (9 - 4)$

A. -5 — Student hasn't taken account of the brackets

B. 13 — Student has calculated $9 - 4$ first but has added 8 not subtracted from 8

C. 3

D. -3 — Student has calculated $9 - 4$ first, but then written it first and subtracted 8 from it. Revisit how to lay out calculations with multiple steps

14. Work out 4×-3

A. 1 — Student has added the numbers together. $4 + -3$

B. -1 — Student has added numbers but applied rule of multiplication

C. 12 — Student has not taken into account the negative sign.

D. -12

15. Find the value of $2r + s$ when $r = 5$ and $s = 1$

A.	26	Student has simply replaced r with 5 – they do not understand or recognise the conventions of writing a multiplication with algebra Student has added 5 and 1 together before multiplying by 2. They have incomplete understanding of the order of operations.
B.	12	
C.	11	
D.	10	Student may have failed to add on 1 or multiplied all three numbers together.

16. Work out $72.3 - 15.19$

A.	57.11	
B.	57.21	Student has calculated 10 subtract 9 in hundredths column without regrouping tenths.
C.	63.29	Student has subtracted largest from smallest in each place value column.
D.	67.21	Student has subtracted in the tenths and ones columns as if they had regrouped (but made no changes to the other columns).

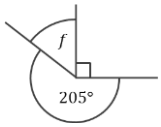
17. Given that $5 \times 76 = 450$
work out the value of 5×7.6

A.	4500	Student has incorrectly made the answer 10 times larger
B.	450	Student thinks answer remains the same
C.	45	
D.	4.5	Student thinks the answer must contain a decimal

18. Work out $1.02 \div 100$

A.	0.102	Divided by 10
B.	0.0102	
C.	0.00102	May have 'added' 2 0's after the decimal point, followed by the digits of the original number in order Multiplied by 100
D.	102	

19. Work out the size of angle f.



A.	65°	
B.	155°	$360 - 205 = 155$. Forgot to subtract the right angle.
C.	25°	$205 - 180 = 25$.
D.	115°	$205 - 90 = 115$.

20. Work out $20 \div 4 + 2 \times 6$

A.	$\frac{20}{16}$	Performed $4 + 2 \times 6(=16)$ first, then performed $20 \div 16$
B.	17	
C.	20	Performed 4+2 first
D.	42	Has performed operations in order written

21. Which of these is 72 written as a product of its prime factors?

A.	12×6	Student has written as a non-prime factor pair
B.	$3^2 \times 8$	Student has not completed the prime factorisation
C.	$2^3 \times 3^2$	
D.	$2^2 \times 3^3$	Student has misused indices.

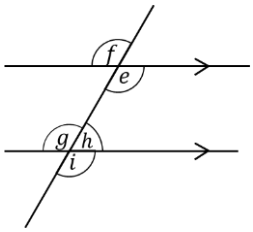
22. Factorise $15a - 10$

A.	$5(10a + 5)$	Student has considered this as an additative calculation.
B.	$5a$	Student has identified numerical factor but has incomplete understanding of how to complete the factorisation.
C.	$5(3a - 10)$	Student has correctly identified the factor and factorised the first term but ignored the second term.
D.	$5(3a - 2)$	

23. What is -3 squared?

A.	-6	Performed -3×2
B.	6	Performed -3×2 but made the answer positive
C.	-9	Either performed 3^2 then multiplied by -1, or may believe $-3 \times -3 = -9$
D.	9	

24. Which angle is vertically opposite angle e?



A.	f	
B.	g	This is alternate to e
C.	h	This is allied with e
D.	i	This is corresponding to e

25. Work out $-8 \div -2$

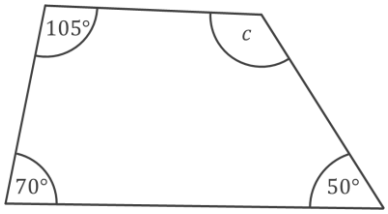
A. -10
B. -4
C. -6
D. 4

May have added

Revisit dividing with negative numbers

May have subtracted

26. Work out the size of angle c.



A. $105°$
B. $110°$
C. $130°$
D. $135°$

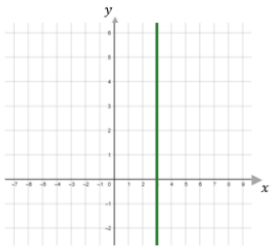
Assumed the angle of 105° and angle c are equal.

May have assumed opposite angles sum to $180°$

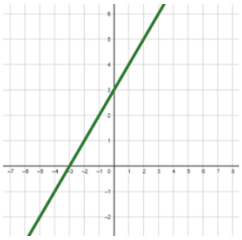
Assumed there is a pair of parallel sides and used allied angles.

27. Which of these graphs shows the line $y = 3$?

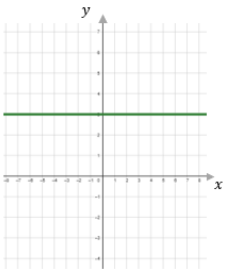
A.



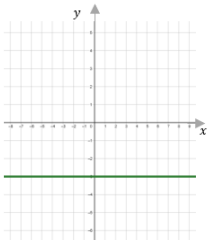
B.



C.

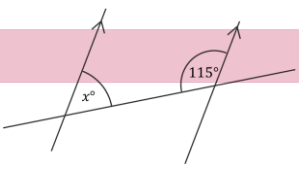


D.



28. Work out the value of x.

A. $115°$
B. $65°$
C. $245°$
D. $75°$

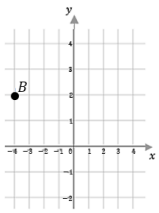


Likely using corresponding or alternate angles are equal. Revisit parallel line rules.

$360° - 115°$. Revisit parallel line rules.

Miscalculation of $180° - 65°$

29. What is the coordinate of point B?



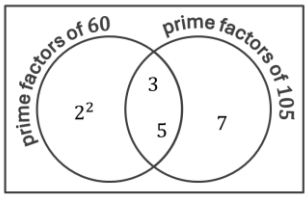
A. $(4, -2)$ Student has transposed negative signs

B. $(-4, 2)$

C. $(-4, -2)$ Student has read x coordinate accurately but thinks that y must be negative as well

D. $(2, -4)$ Student has read y axis first.

30. What is the highest common factor of 60 and 105?
Use the Venn diagram to help you.



$60 = 2^2 \times 3 \times 5$

$105 = 3 \times 5 \times 7$

A. 15

B. 14 Students have multiplied the non-common factors

C. 210 Students have multiplied each of the factors

D. 420 Students have multiplied all of the factors.

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Section B: Open response

1. The temperature in London at 9am was $-3°C$.
By midday, it had risen by $7°C$.

Work out the temperature at midday.

Correct answer: $4°C$

Look for incorrect answer of 10 (student has added 3 and 7).

2. Fully factorise $12a - 20$

Correct answer: $4(3a - 5)$

Look for partial factorisation i.e. $2(6a - 10)$
Look for students using expansion to check their answer for accuracy.

3. Work out 32 × 27

Show all your working.

Correct answer: 864

Possible method 1:

	3^1	2
x	2	7
2	2	4
6	4	0
8	6	4

Possible method 2:

×	30	2
20	600	40
7	210	14

Look for zero place holder and accuracy in addition in first method.
Look for understanding of place value in second method and accuracy in addition.

4. Work out $(3^2 + 1)^2$

Correct answer: 100

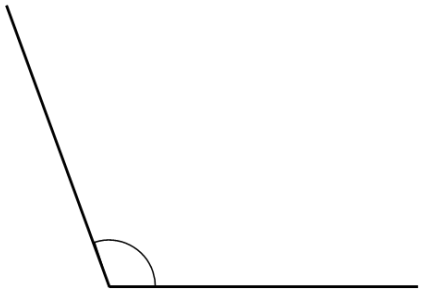
Look for an incorrect answer of:
49 from $(3 \times 2 + 1)^2$ or
14 from $(3 \times 2 + 1) \times 2$

5. Find the value of $y^2 - xz$ when $x = 2,\ y = 1$ and $z = 3$

Correct answer: -5

Look for accurate working e.g. $1^2 - (2 \times 3) = 1 - 6$
Look for incorrect mathematical grammar e.g. $1^2 = 1 - (2 \times 3) = -5$

6. Measure this angle as accurately as you can:



Correct answer: $110°$
Look for incorrect answers of $70°$ (used the wrong scale on the protractor).

7. I set two snooze alarms after my alarm goes off at 7:00

My first snooze alarm goes off every 5 minutes.

My second snooze alarm goes off every 7 minutes.

How many minutes after 7.00 will both snooze alarms go off together?

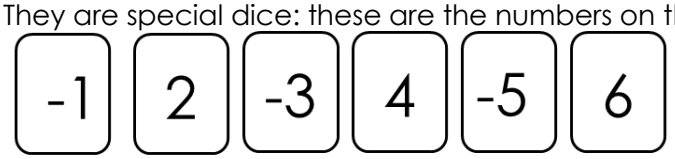
Correct answer: 35 minutes

Look for lists of 5 minute intervals after 7.00 or multiples of 5

Look for lists of 7 minute intervals after 7.00 or multiples of 7

Look for identification of two times which are the same or identification of the answer being 35 minutes after 7.00

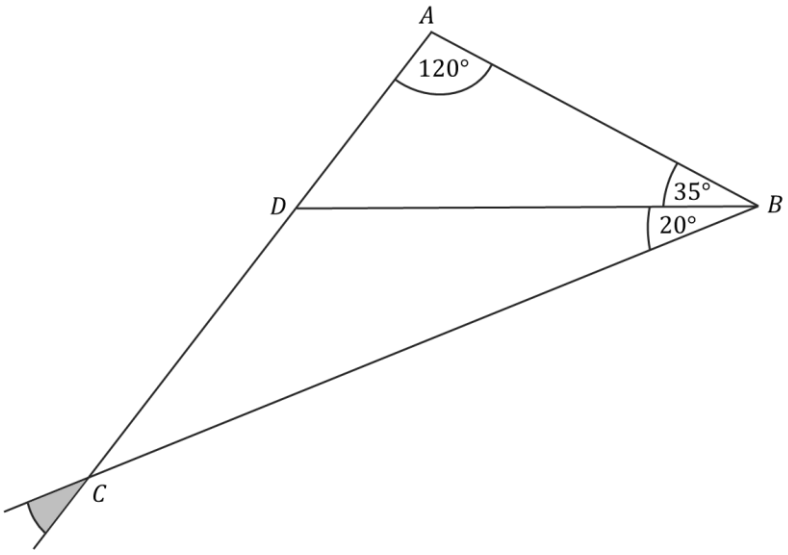
8. I have two identical dice.
They are special dice: these are the numbers on them.



I roll them and get the sum of the two faces.
What is the **smallest** possible sum?

Correct answer: -8
i.e. $-5 + -3$
Look for students attempting to get the smallest possible positive sum e.g. $4 - 2$

9. Work out the size of the shaded angle.
Give reasons for your answer.

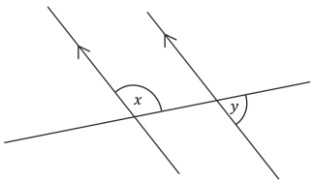


Correct answer: $c = 5$ because vertically opposite angles are equal

and $180 - (120 + 35 + 20)(= 5)$ because angles in a triangle sum to 180°

Look for inefficient methods e.g. working out angle ADB first.

10. Write an equation linking x and y.
Give reasons for your answer.



Correct answer: $x = 180 - y$

Accept also $x + y = 180$ and $180 - x = y$

with 'corresponding angles are equal, and angles on a straight line sum to 180°'.

Look for students trying to substitute values for x and y to help them.

Look for students using co-interior angles and vertically opposite angle facts instead.

END OF ASSESSMENT