Year 10 (2021) MATHEMATICS

Term 4 Stage 5.1/5.2/5.3 Task Notification

Date	Week 5A: **Thursday, 4th November, 2021**
Weighting	35% of Year 10 Mathematics Assessment
Classes Assessed	This assessment is compulsory for:

Class	Teacher	Period
10MATR	Mr Mansouri	Period 1
10MATO	Mr Smithard	Period 1
10MATY	Mr Salame	Period 1
10MATG	Mrs Ibrahim	Period 1
10MATB	Mr Fomin	Period 3
10MATI	Mr Smithard	Period 3
10MATV	Mrs Ibrahim	Period 3
10MATP	Mr Mansouri	Period 3

Examination Details	Duration: **40 minutes** Format: Multiple Choice and Short Answer (Calculator) Venue: Classrooms
Equipment Required	The following equipment is required for this assessment task: • Blue and/or black pens • Board-approved scientific calculator • Lead pencils • Ruler • Eraser Note: No photocopies or borrowing of equipment will be permitted.
Marking Criteria	• All questions should be attempted. • All questions are worth 1 mark unless otherwise indicated. • To obtain full marks, answers must be completely correct and all necessary working must be shown. • Some marks may be awarded for partially correct answers. • Trivial attempts will be counted as a non-attempt and may result in an official warning letter being issued.
Absentee Procedures	If you are absent on the day of this examination, upon your return to school you must present a **medical certificate** to your class teacher or the head teacher explaining your absence, otherwise a mark of zero may be awarded. You will be required to sit for your examination on the first day you return to school.

Syllabus Outcomes

The following table lists all the Stage 4 and Stage 5 knowledge and numeracy skills that will be assessed in this Common Test.

Strands	Assessment Outcomes
Number and Algebra	Topic: **Linear Relationships** **MA5.1-6NA** Determines the midpoint, gradient and length of an interval, and graphs linear relationships. **MA5.2-5NA *** Recognises direct and indirect proportion, and solves problems involving direct proportion. **MA5.2-8NA *** Solves linear inequalities using analytical and graphical techniques. **MA5.3-8NA *** Uses formulas to find midpoint, gradient and distance on the Cartesian plane, and applies standard forms of the equation of a straight line. **MA5.3-7NA *** Solves complex linear and simultaneous equations.
Measurement and Geometry	Topic: **Properties Of Geometrical Figures** • **MA4-18MG** Identifies and uses angle relationships, including those related to transversals on sets of parallel lines. • **MA4-17MG** Classifies, describes and uses the properties of triangles and quadrilaterals, and determines congruent triangles to find unknown side lengths and angles. • **MA5.1-11MG** Describes and applies the properties of similar figures and scale drawings. • **MA5.2-14MG** Calculates the angle sum of any polygon and uses minimum conditions to prove triangles are congruent or similar. • **MA5.3-16MG** Proves triangles are similar, and uses formal geometric reasoning to establish properties of triangles and quadrilaterals.

Measurement and Geometry	Topic: **Right Angled Triangles** • **MA4-16MG** Applies Pythagoras' theorem to calculate side lengths in right-angled triangles, and solves related problems • **MA5.1-10MG** Applies trigonometry, given diagrams, to solve problems, including problems involving angles of elevation and depression • **MA5.2-13MG** Applies trigonometry to solve problems, including problems involving bearings • **MA5.3-15MG** Applies Pythagoras' theorem, trigonometric relationships, the sine rule, the cosine rule and the area rule to solve problems, including problems involving three dimensions
Working Mathematically	**MA5.1-1WM** Uses appropriate terminology, diagrams and symbols in mathematical contexts. **MA5.1-2WM** Selects and uses appropriate strategies to solve problems. **MA5.1-3WM** Provides reasoning to support conclusions that are appropriate to the context.
Textbook Chapters	• Cambridge 10: NSW Gold Chapters 5, 6, 7 • Cambridge 10: 5.1 & 5.2 Chapters 6, 7, 8 • Cambridge 10: 5.3 Chapters 5, 6, 7

* Note for 5.3 students:

Stage 5.3 course outcomes will be assessed in an additional examination in Week 5A on Wednesday 3rd November. See your teacher for more information.

Class	Teacher	Period
10MATR	Mr Mansouri	1

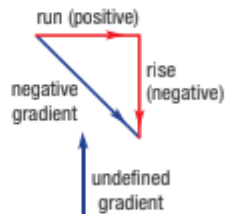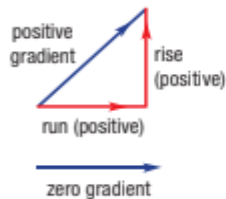# Reference Sheets
Linear Relationships

Gradient of a line
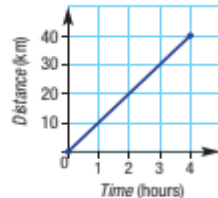
Gradient measures the slope of a line

Gradient $m = \frac{\text{rise}}{\text{run}}$ e.g.
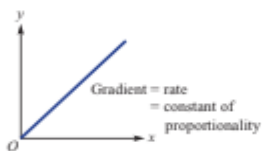
$m = \frac{4}{2} = 2$

(2, 6)
rise = 4
run = 2

positive gradient — rise (positive), run (positive)

negative gradient — run (positive), rise (negative)

zero gradient

undefined gradient

A rate equals the gradient with units

e.g. Speed $= \frac{40}{4} = 10$ km/h

Distance (km) vs Time (hours)

Equation of a line

$y = mx + b$

gradient y-intercept

- The rule is a linear equation.
- The graph is made up of points in a straight line.

Special lines

Horizontal lines
e.g. $y = 3$
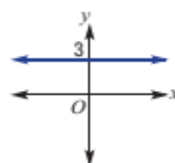
Vertical lines
e.g. $x = 2$
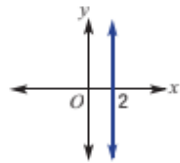
Sketching a line

Plotting straight-line graphs
- Complete a table of values.
- Plot points and join them to form a straight line.

Using the y-intercept and gradient
- Plot the y-intercept (b).
- Use the gradient to plot the next point.
- Join to form a straight line.

e.g. $y = 2x - 1$
$b = -1$ $m = \frac{2}{1}$
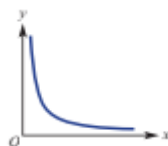
rise = 2
run = 1

For two variables that are directly proportional

- Both variables will increase or decrease together at the same rate.
- The rule is $y = kx$, where k is the constant of proportionality.

Gradient = rate
= constant of proportionality

For two variables that are indirectly (or inversely) proportional

- When one variable increases, then the other variable decreases.
- The graph is a curve.

Linear relationships

Using the axes intercepts

- Plot each axis intercept   e.g. $y = -2x + 4$
  x-intercept (when $y = 0$)
  y-intercept (when $x = 0$)
- Join points to form a straight line.

y-intercept = 4
x-intercept = 2

Midpoint of a line segment

Find the average of the end point coordinates

$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

$x = \frac{-3 + 5}{2} = \frac{2}{2} = 1$

$y = \frac{-2 + 3}{2} = \frac{1}{2} = 0.5$

$\therefore M = (1, 0.5)$

(5, 3)
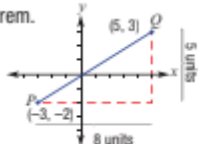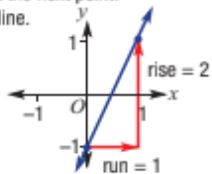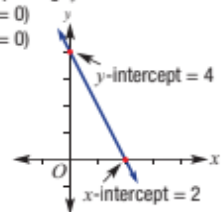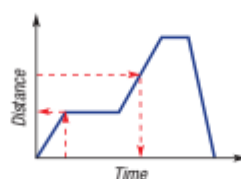(−3, −2)

Length of a line segment

Use Pythagoras' theorem.

$PQ^2 = 8^2 + 5^2$
$PQ^2 = 64 + 25$
$PQ^2 = 89$
$PQ = \sqrt{89}$ units
$\sqrt{89}$ is an exact length.

(5, 3) Q
(−3, −2) P
5 units
8 units

Distance–time graph

Distance vs Time

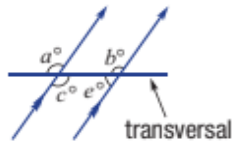- Flat segment means the object is at rest.

Reading a graph:
- Start on given distance; move across to line then down to time scale (or in reverse).

Linear modelling

- Find a rule in the form $y = mx + b$ using the appropriate pronumerals.
- Sketch a graph.
- Apply the rule to solve problems.
- Answer the problem in words.

Properties of Geometrical Figures

Parallel lines

$a = b$ corresponding
$b = c$ alternate
$c + e = 180$ co-interior
$a = c$ vertically opposite

Triangles

Angle sum $= 180°$

scalene   isosceles   equilateral
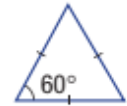
acute   obtuse   right
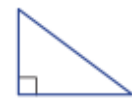
Exterior angle theorem:

$x = a + b$

Congruent triangles

Equal in size and shape

Tests: SSS, SAS, AAS, RHS

A congruence statement:
$\triangle ABC \equiv \triangle DEF$

Similar triangles

Equal in shape and sides are in proportion

There are four tests of similarity.
1 Two angles of a triangle equal two angles in another triangle.
2 Three sides of a triangle are proportional to three sides of another triangle.
3 Two sides of a triangle are proportional to two sides of another triangle and the included angles are equal.
4 The hypotenuse and another side of a right-angled triangle are proportional to the hypotenuse and a second side of another right-angled triangle.

A similarity statement:
$\triangle ABC \;|||\; \triangle DEF$

Properties of geometrical figures

Quadrilaterals

Angle sum $= 360°$

Special types include:
• parallelogram
• square
• rectangle
• rhombus
• kite
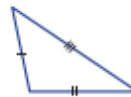• trapezium

Applications of similarity

If $\triangle ABC \;|||\; \triangle DEF$ then:
• Scale factor $= \frac{DE}{AB}$ or $\frac{DF}{AC}$ or $\frac{EF}{BC}$
• Length ratio $a : b$, Scale factor $= \frac{b}{a}$
• Area ratio $a^2 : b^2$, Scale factor $= \frac{b^2}{a^2}$
• Volume ratio $a^3 : b^3$, Scale factor $= \frac{b^3}{a^3}$

Polygons

Interior angle sum $S = 180° \times (n - 2)$
Exterior angle sum $= 360°$

Regular polygons have:
• equal side lengths
• equal angles
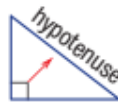
Right Angled Triangles

Trigonometric ratios

S
O
H
$\sin \theta = \frac{O}{H}$

C
A
H
$\cos \theta = \frac{A}{H}$
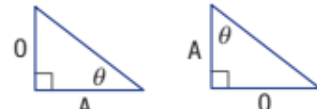
T
O
A
$\tan \theta = \frac{O}{A}$

Hypotenuse

The *hypotenuse* is the longest side in a right-angled triangle. It is opposite the right angle.

hypotenuse

Opposite and Adjacent

In a right-angled triangle, the sides marked 'opposite' and 'adjacent' are named according to the angle used.

O   A θ
θ
A   O

Finding angles

Use $\sin^{-1}$, $\cos^{-1}$ or $\tan^{-1}$.

4
3
θ

$\tan \theta = \frac{3}{4}$
$\theta = 36.869...°$
$\theta = 37°$
(to the nearest degree)

Right-angled triangles

Finding lengths with trigonometry

10
x
30°

$\sin 30° = \frac{x}{10}$
$x = 10 \sin 30°$
$x = 5$

12
x
30°

$\sin 30° = \frac{12}{x}$
$x \times \sin 30° = 12$
$x = \frac{12}{\sin 30°}$
$x = 24$

Pythagoras' theorem

For the triangle shown, *Pythagoras' theorem* is:

a
c
b

$c^2 = a^2 + b^2$

Finding the hypotenuse

3
1
c

$c^2 = 1^2 + 3^2$
$c^2 = 10$
$c = \sqrt{10}$
$= 3.2$ (1 decimal place)

Finding a shorter side

x
3
5

$5^2 = x^2 + 3^2$
$x^2 = 5^2 - 3^2$
$x^2 = 16$
$x = 4$

Applications

θ
d
h

(cube)

Bearings

3-digit angle clockwise from north

N
60°
Q
060°
W
P
E
S

N
A
60°
300°
W
O
E
S

Bearing of Q from P is 060°.

Bearing of A from O is 300°.

Elevation and depression

angle of elevation

angle of depression