At level 9, students are working towards level 10 standards
At level 10, students are working towards level VCE Foundation standards

Integers Game

To play the game:

- *Get a set of* ***three dice*** *and roll them* ***all together***
- *You get 5 rolls each round*
- *If the sum of the dice is between or including 3 and 10, opposition scored against you while you were on the ice!* ***Take away two points***
- *If the sum of the dice is between or including 11 – 18, a team mate scored a goal with your assistance!* ***Give yourself +1 point***
- *When you land a double or triple, you have scored a goal!* ***Add +2 points to your score***
- *Jot down how many points you get throughout the round then add them up*
- *The player with the highest amount of points wins!*

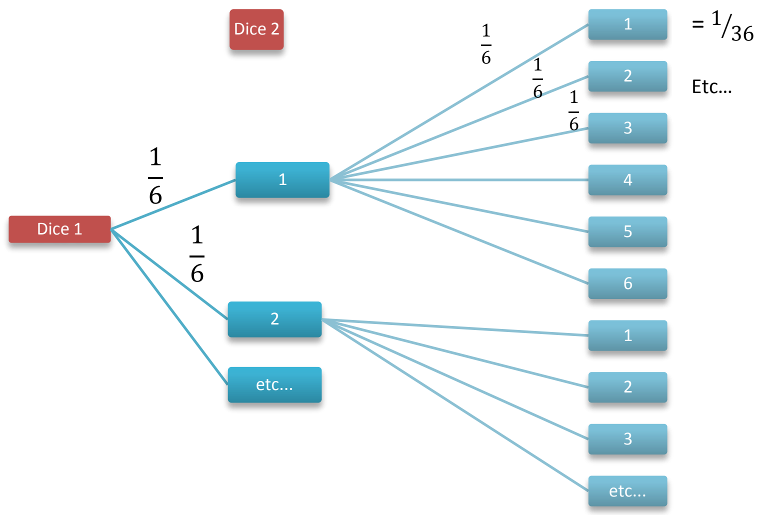
Example: *Amy rolls*

2,3,6 ~ 4,3,2 ~ 5,5,1 ~ 1,2,3 ~ 6,4,3

	Points awarded / lost					TOTAL
Example:	+1	-1	+ 2	-1	+1	**+ 2**
Round 1						
Semi Final						
Grand Final						
					TOTAL:	

What is the total number of outcomes when rolling three dice at once?
$6^3 = 216$

Draw a tree diagram to illustrate all possible results of rolling double numbers in one roll

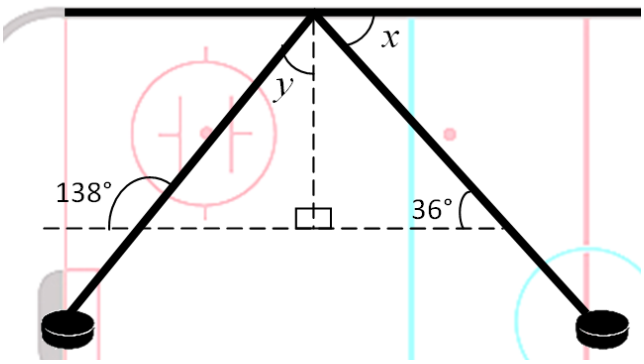


What is the probability of rolling double numbers in one roll? $\frac{1}{36} \times 6 = \frac{6}{36} \quad \therefore \frac{1}{6}$

Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Number and Algebra:** Number and Place Value	Literacy Numeracy Creative and Critical Thinking	**Level 9 & 10:** Solve numerical expressions with integers
	Statistics and Probability: Chance		**Level 9:** List all outcomes for two-step chance experiments using tree diagrams. Probabilities to outcomes and overall events are calculated and assigned **Level 10:** Describe the results of two- and three-step chance experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence

Geometry: Angle Properties

1. *Calculate the angle at which the puck hits the boards and goes into the net (x).*



Students have two ways of retrieving answer:

- ***Realising that the angle x and 36° are alternate angles, therefore are congruent***

  ∴ x = 36°

  OR

- ***Determine the third angle of the triangle:***
  180° – 36° – 90° = 54°
  Subtract this angle from 90 to solve x

  ∴ 90° - 54° = 36° = x

2. *Using this answer and the other angles given, calculate angle y.*

To calculate y, students must first find the opposite angle of 138° by subtracting from 180° and then using that answer with the knowledge that all angles in a triangle adding up to 180° calculate y

∴ y =180° - [(180°-138°) + 90°]

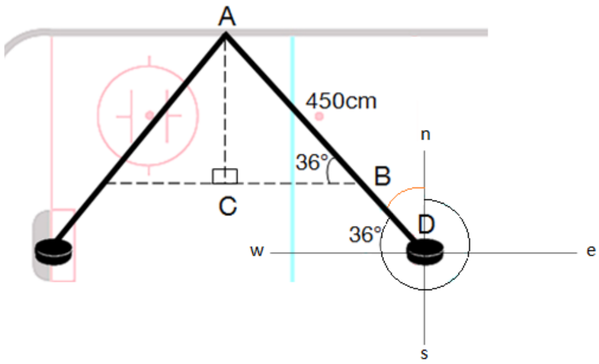
∴ y = 180° - 132°

∴ y = 48°

Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Measurement and Geometry:** Geometric Reasoning	Literacy Numeracy Creative and Critical Thinking	**Level 9:** Enlargement transformation is used to explain similarity and develop the conditions for triangles to be similar **Level 10:** Formulate proofs involving congruent triangles and angle properties, Apply logical reasoning, including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes
	Number and Algebra: Patterns and algebra		**Level 9 & 10:** Form algebraic equations and apply the distributive law to the expansion of algebraic expressions, and collect like terms where appropriate'

Measurement: Trigonometry

3. *If James is standing at point D, write down his compass and true bearings from point D to point A*



Students need to realise that angle B = 36°
∴ angle D = 36°

<u>For true bearing:</u>

360°-(90-36)
= 360° - 54°

OR

90° x 3 + 36°
=260° + 36°
∴ True bearing = 306°

<u>For compass bearing</u>

90° - 36°
= 54°

∴ compass bearing = N 54° W

4. *Given the length of line AB, determine the length of CB. Give your answer in metres and to two decimal places.*

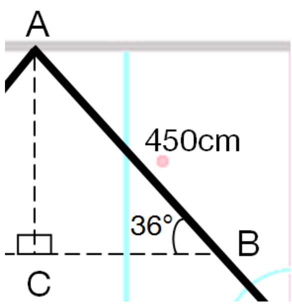
$\cos\theta = \frac{Adjacent}{Hypotenuse}$

$\therefore \cos 36° = \frac{x}{450}$

$\therefore 450 \times \cos 36° = x$

$\therefore x = 364.06cm$

$\therefore x = 3.64m$



Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Measurement and Geometry:** Geometric Reasoning	Literacy Numeracy	**Level 9:** Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar **Level 10:** Apply logical reasoning, including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes

	Measurement and Geometry: Pythagoras and Trigonometry	Creative and Critical Thinking	**Level 9:** Apply trigonometry to solve right-angled triangle problems **Level 10:** Solve right-angled triangle problems including those involving direction

Cartesian Planes & Linear Equations

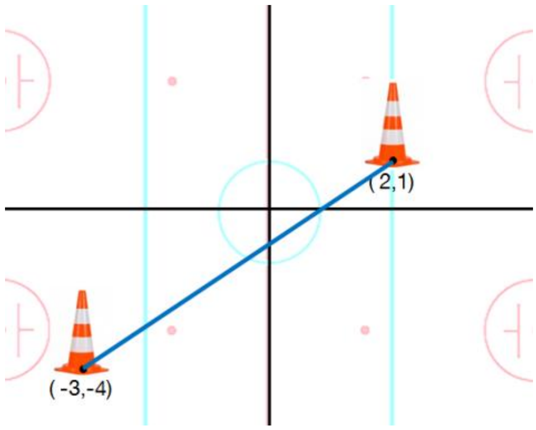
1. *Label the x and y axis on the Cartesian plane*
2. *Add a number scale on both the x and y axis*
3. *As a drill, hockey skaters are required to pass a puck from point (2,1) and receive the pass at point (-3,-4). Write the linear equation between these two points*

$\boxed{y = mx + c}$

Gradient $= \frac{rise}{run}$ $\therefore m = \frac{1--4}{2--3}$

$\therefore m = \frac{5}{5}$

$\therefore m = 1$



Substitute in m and a coordinate to solve c

$\therefore 1 = 1*2 + c$

$\therefore 1 = 2 + c$

$\therefore c = -1$

$\therefore y = x - 1$

Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Number and Algebra:** Linear and non-linear relationships	Literacy Numeracy Creative and Critical Thinking	**Level 9:** Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software **Level 10:** Solve problems involving linear equations, including those derived from formulas

Numbers: Algebraic Equations and Substitution

During an AIHL match, there are 983 seats in the O’ Brien Group Arena grandstand.
If 63 of these are reserved for VIP and 189 seats have been pre-purchased

1. *Write an equation to solve for x, where x is the amount of remaining seats in the grandstands*
   $x = 983 – (63 + 189)$

2. *Solve the equation*
   $\therefore x = 983 – 252$
   $\therefore x = 731$

3. *If x= 946, calculate the new total of grand stand seats*
   $946 = y – (63 + 189)$
   $\therefore y = 946 + (63+189)$
   $\therefore y = 946 + 252$
   $\therefore y = 1198$

Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Number and Algebra:** Real Numbers	Literacy Numeracy Creative and Critical Thinking	**Level 9:** Students express numbers in scientific notation
	Number and Algebra: Patterns and algebra		**Level 9 & 10:** Extend and apply the distributive law to the expansion of algebraic expressions

Money and Financial Mathematics

There are 40 lights above each rink. Each light omits 1,000 watts of energy per hour.

1. *How much energy does it take to run all of them for one hour?*

   1,000 * 40 = 40,000 watts

2. *To run all the lights costs $38.00 per hour. How much would it cost to run three quarters of the lights for 3 hours?*

   Calculate 3/4 of $38.00

   0.75 x $38

   = $28.50

   Multiply by three for three hours

   = $28.50 x 3

   = $85.50

3. *The cost for a concession to skate is $24.00. Use your answer from question 2 to help find out how many concession skaters would need to come in in order to cover the cost of running 3/4 of the lights for three hours.*

   Give your answer as a fraction and as a whole number rounded up to the next whole one

   $85.50 / 24

   = 3.56

   =4 concession skaters would need to come in to cover the cost of lighting

Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Statistics and Probability:** Data Representation and Interpretation	Literacy Numeracy Creative and Critical Thinking	**Level 9:** Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems **Level 10:** Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies

Measurement: Pythagoras' Theorem

To meet regulation, the ramp is required to rise one metre for every 12 metres travelled horizontally as shown on the diagram below (not to scale).

1. *Use Pythagoras' Theorem to calculate the diagonal length of the ramp*

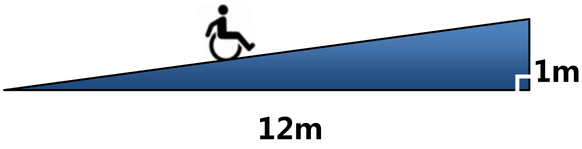
$\boxed{c^2 = a^2 + b^2}$

∴$C^2 = 1^2 + 12^2$

∴$C^2 = 144 + 1$

∴$C = \sqrt{145}$

∴C = 12.04 m



2. *If the ramp is required to rise to a level of two metres, calculate the new length of the ramp (hypotenuse).*
   Hint: Use the legal requirement ratio to calculate the horizontal length

Horizontal length (students can alternatively use ratio to calculate diagonal length)

$\frac{1}{12} = \frac{2}{x}$

∴x = 24

∴$C^2 = 2^2 + 24^2$

∴$C = \sqrt{580}$

∴C = 24.08 m

Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Measurement and Geometry:** Pythagoras and Trigonometry	Literacy Numeracy Creative and Critical Thinking	**Level 9:** Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles **Level 10:** Solve right-angled triangle problems including those involving direction and angles of elevation and depression using Pythagoras' Theorem

Measurement: Similar Triangles

Use ratios (similar triangles) to determine the height of the ramp if the horizontal length is:

a. 5m

$\frac{1}{12} = \frac{x}{5}$

∴$x = \frac{5}{12}$

b. 16m

$\frac{1}{12} = \frac{x}{16}$

∴$x = 1\frac{1}{3}$

c. 24m

$\frac{1}{12} = \frac{x}{24}$

∴x = 2

Domain	Content Strand	Proficiency Strand	Key Elements of Standards

Mathematics	**Measurement and Geometry:** Geometric Reasoning	Literacy Numeracy Creative and Critical Thinking	**Level 9 & 10:** Solve problems using ratio and scale factors in similar figures

Measurement: Surface Area and Volume

1. *The length of the NHL rinks and O’ Brien Group Arena rinks is 60m. The width of O’ Brien Group Arena is 2.05m wider on each wing than NHL rinks, which is 25.9m wide. How many metres wide is the O’ Brien Group Arena Rink?*

   25.9 + (2.05 x 2)

   = 25.9 + 4.10

   ∴ O’ Brien Group Arena = 30m wide

2. *If the rink was a rectangle, what would the total surface area of both of the two O’ Brien Group Arena rinks combined be? Hint: both rinks are the same dimensions*

   Area of one rink = 30 x 60m

   = 1,800m²

   ∴ Area of two rinks = 3,600m²

3. *The thickness of ice held on a rink is 3cm. What is the volume of water required to fill this area of Ice?*

   V = W * L * H

   V = 3,600 * 3

   V = 10,800L

Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Measurement and Geometry:** Using units of measurement	Literacy Numeracy Creative and Critical Thinking	**Level 9:** Calculate the surface area and volume of right prisms **Level 10:** Solve problems involving surface area and volume for a range of prisms

Quadratic Equations: Simplifying, Solving and Graphing

During the weekdays the O’ Brien Group Arena is open from 9am – 3pm. During this time the amount of skaters in the venue is tracked and then converted into an equation:

$$-10x^2 + 60x = 0$$

1. *Simplify the equation*

   $-10x(x - 6) = 0$

2. *Solve for x*

   $x = 0$

   $x = 6$

3. *Find the turning point*

   $x = \frac{6-0}{2}$

   $x = 3$

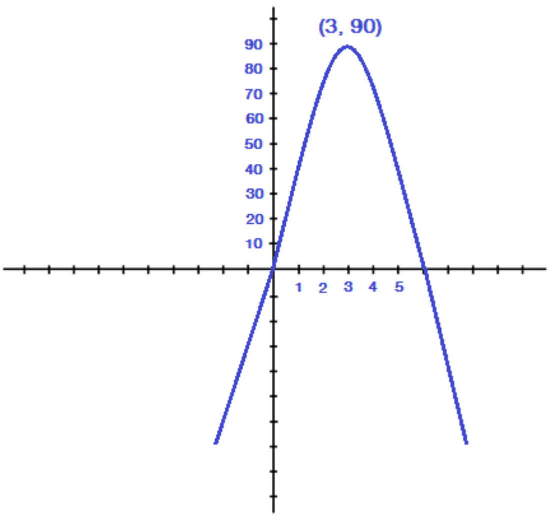
   Substitute x for y

   $\therefore -10(3)^2 + 60(3) = y$

   $\therefore y = -90 + 180$

   $\therefore y = 90$

   ∴ Turning Point = (3,90)



4. *Graph the equation, where x shows the number of hours after opening and y shows the amount of skaters*
5. *At what time was it the busiest with skaters?*

   3 hours after opening

.: ***12pm***			
Domain	Content Strand	Proficiency Strand	Key Elements of Standards
Mathematics	**Number and Algebra:** Linear and non-linear relationships	Literacy Numeracy Creative and Critical Thinking Information and communication technology capability	**Level 9:** Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations **Level 10:** Solve simple quadratic equations using a range of strategies. Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate