



# THINKHIGHER - 2012

## WELCOME TO TKP

Good morning Engineers! Reminders from yesterday's lessons:

Two primary elements of engineering are requirements<sup>1</sup> and constraints<sup>2</sup>. Requirements are goals our design must achieve. Constraints are the limits to what we can do.

TKP works in teams. We don't really compete against each other - rather, teams compete together to come up with the best solutions to the constraints. This is called collaborating<sup>3</sup>. If requirements and constraints are integral to engineering - collaborating is integral to TechKnowPlay, including ThinkHigher.

Collaborative engineering teams start with plans. We talk about our ideas, we listen to each other, we write them down and/or sketch them. . . We don't start building without this step. That would waste materials, energy and most importantly, our time. 15 minutes of planning can be worth many hours of work.

Before we complete the bridges and towers for our railway network, we are going to work on planning as a skill.

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TKP has received a modest contract from a small municipality by the unlikely name of "Hogsmeade." No one really knows where they are. . . or can either confirm that they really exist. They sent us letters carried by owls. Owls!

They keep using strange words. Their monetary system doesn't work in base x10. . . but they paid us an advance in gold. . . The coins have pictures of this guy with a long beard, but it is real gold.



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<sup>1</sup> requirement - what your design must accomplish - for example, "the bridge must be 60cm long," or "the building must be 40cm tall."

<sup>2</sup> constraint - a limiting factor. In engineering it means only working with a certain material - or only using a certain amount of it. Time is often a constraint in engineering projects.

<sup>3</sup> collaborating - more than one person working together to produce a better result than either can do alone

# TKP-HOGSMEADE BUILDING CONTRACT, PHASE ONE

- 1) Hogsmeade wants us to build several towers out of wood which has no binder. (Binders would be: Glue, concrete, nails, rivets. . .) The towers must be three beams tall vertically, and three beams tall horizontally.
- 2) Hogsmeade wants us to build some walls for them. They must be built from Lego bricks, and 'have no charms used in their construction, especially by Muggles.' "Muggles?" Seriously, we're not really sure these people speak English. . . Anyway, walls must be a width of 30 Lego studs and a height of 9 Lego bricks.
- 3) To insure that no Muggles used inappropriate charms or spells, we must present all plans to the Hogsmeade committee when we show them the finished product. Seriously, what's a 'Muggle'???

Constraint: Towers must resist the 'shake test' - that is, they must remain intact when a counselor shakes the table gently.



Constraint: Walls must resist the 'flick test' - that is, they must remain intact when a counselor gives it a good finger flick.

Payment: The TKP Group will be paid in Galleons, Knuts and a bunch of currency we don't think exists. But we're told we'll get \$3,000,000 for each tower which meets these constraints. We will be paid \$3,000,000 for each wall which meets these constraints.

Payment: The TKP Group will be paid \$10,000,000 for every schematic which we use in a final product, and \$15,000,000 for every schematic which is an improvement on a previous design.

Bonus: Any team which goes through 6 or more design versions of either design will be paid an additional \$50,000,000 for a final wall, and another \$50,000,000 for a final tower.

Hint: We think this is a little strange. But Hogsmeade asked us to remind you not to tickle sleeping dragons. . .